

99E-104

4.5 PSP Cover Sheet (Attach to the front of each proposal)

An Evaluation of the Potential Impacts of the Chinese Mitten Crab

Proposal Title: (Eriocheir sinensis) on the Benthic Community in the Delta and Suisun Bay

Applicant Name: Leo Winternitz and Cindy Messer

Mailing Address: Department of Water Resources, 3251 S St., Sacramento, CA 95816

Telephone: (916) 227-7548 and (916) 227-7545

Fax: (916) 227-7554

Email: lwintern@water.ca.gov and cmesser@water.ca.gov

Amount of funding requested: \$ 147,799 for 14 mos. years

Indicate the Topic for which you are applying (check only one box).

- | | |
|--|--|
| <input type="checkbox"/> Fish Passage/Fish Screens | <input checked="" type="checkbox"/> Introduced Species |
| <input type="checkbox"/> Habitat Restoration | <input type="checkbox"/> Fish Management/Hatchery |
| <input type="checkbox"/> Local Watershed Stewardship | <input type="checkbox"/> Environmental Education |
| <input type="checkbox"/> Water Quality | |

Does the proposal address a specified Focused Action? ☒ yes ☐ no

What county or counties is the project located in? Solano, Sacramento, Contra Costa, San Joaquin

Indicate the geographic area of your proposal (check only one box):

- | | |
|---|--|
| <input type="checkbox"/> Sacramento River Mainstem | <input type="checkbox"/> East Side Trib: _____ |
| <input type="checkbox"/> Sacramento Trib: _____ | <input type="checkbox"/> Suisun Marsh and Bay |
| <input type="checkbox"/> San Joaquin River Mainstem | <input type="checkbox"/> North Bay/South Bay: _____ |
| <input type="checkbox"/> San Joaquin Trib: _____ | <input checked="" type="checkbox"/> Landscape (entire Bay-Delta watershed) |
| <input type="checkbox"/> Delta: _____ | <input type="checkbox"/> Other: _____ |

Indicate the primary species which the proposal addresses (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> San Joaquin and East-side Delta tributaries fall-run chinook salmon | <input type="checkbox"/> Spring-run chinook salmon |
| <input type="checkbox"/> Winter-run chinook salmon | <input type="checkbox"/> Fall-run chinook salmon |
| <input type="checkbox"/> Late-fall run chinook salmon | <input type="checkbox"/> Longfin smelt |
| <input type="checkbox"/> Delta smelt | <input type="checkbox"/> Steelhead trout |
| <input checked="" type="checkbox"/> Splittail | <input checked="" type="checkbox"/> Striped bass |
| <input type="checkbox"/> Green sturgeon | <input checked="" type="checkbox"/> All chinook species |
| <input checked="" type="checkbox"/> Migratory birds | <input type="checkbox"/> All anadromous salmonids |
| <input checked="" type="checkbox"/> Other: <u>grass shrimp, white sturgeon</u> | |

Specify the ERP strategic objective and target (s) that the project addresses. Include page numbers from January 1999 version of ERP Volume I and II:

Restore primary and secondary foodweb production, Volume I pp. 30/40 Vol. II pp. 155

Understand how invasive species affect ecosystem interactions, Vol. I, pp. 462

Reduce competition for food, habitat and direct predation, Vol. I, pp. 40, 421, 423, 463

Vol. II, pp. 45

Indicate the type of applicant (check only one box):

- | | |
|--|---|
| <input checked="" type="checkbox"/> State agency | <input type="checkbox"/> Federal agency |
| <input type="checkbox"/> Public/Non-profit joint venture | <input type="checkbox"/> Non-profit |
| <input type="checkbox"/> Local government/district | <input type="checkbox"/> Private party |
| <input type="checkbox"/> University | <input type="checkbox"/> Other: _____ |

Indicate the type of project (check only one box):

- | | |
|--|---|
| <input type="checkbox"/> Planning | <input type="checkbox"/> Implementation |
| <input type="checkbox"/> Monitoring | <input type="checkbox"/> Education |
| <input checked="" type="checkbox"/> Research | |

By signing below, the applicant declares the following:

- 1.) The truthfulness of all representations in their proposal;
- 2.) The individual signing the form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or organization); and
- 3.) The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section 2.4) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

Leo Winternitz

Printed name of applicant

Leo Winternitz

Signature of applicant

Executive Summary

Project Title: An Evaluation of the Potential Impacts of the Chinese Mitten Crab (*Eriocheir sinensis*) on the Benthic Community in the Sacramento-San Joaquin Delta and Suisun Bay

Applicant Name: Leo Winternitz and Cindy Messer, Department of Water Resources

Project Description and Primary Biological/Ecological Objectives:

The purpose of this project is to provide information regarding the relationship between the Chinese mitten crab (*Eriocheir sinensis*) and the benthic invertebrate community within the Sacramento-San Joaquin Delta and Suisun Bay. Benthic invertebrates make-up a large part of the Delta aquatic food web. Adverse impacts to the benthic invertebrate food supply may impact survival and productivity of fish and shorebirds. Both native and non-native priority species that may be affected include: chinook salmon, striped bass, white sturgeon, signal crayfish, grass shrimp, splittail and warmwater game fish (ERPP, Volume 1 pp.349-350).

This project will be comprised of nine study sites. The project area includes: Suisun Bay, the Sacramento River (up to the Rio Vista Bridge), the San Joaquin River (as far east as Buckley Cove) and Old River (near the intake to Clifton Court Forebay). The scientific hypothesis that this study will evaluate is: The Chinese mitten crab has an adverse effect on benthos species diversity and abundance in the Sacramento-San Joaquin Delta and Suisun Bay. The primary biological/ecological goals of this project are to determine whether the presence of the Chinese mitten crab in the Sacramento-San Joaquin Delta has an adverse effect on benthic species diversity and abundance and to determine relative abundance of both juvenile and adult crabs at each study site in an effort to estimate Delta-wide relative abundance and distribution during a 14-month period. Other benefits include the opportunity to review the efficiency of several different sampling methods for collecting mitten crabs, which will aid in the development of a trapping system used to control this invasive species. The diverse nature of the study sites, as well as the different habitat types these sites represent should help further our knowledge on habitat preference of migrating and resident mitten crabs. This project will also provide some information regarding the relationship of the mitten crab to a native species of grass shrimp (*Cragnon franciscorum*) and a non-native species of crayfish (*Pacifastacus leniusculus*) which support a small commercial fishery in the system. Primary habitats that this study will examine are tidal perennial aquatic habitat, delta sloughs, shoals, and freshwater habitat.

Monitoring and Data Evaluation:

Benthic monitoring will be conducted using a Ponar dredge. Otter trawling and modified crab traps will be used for mitten crab monitoring. Direct impacts to the benthic community will be investigated using an enclosure study and examination of stomach contents of the crabs. Data will be collected over a fourteen-month period. This study will attempt to detect both short-term and long-term changes in the benthos. Short-term changes (seasonal) will be evaluated by comparing data before, during and after migration of the crabs through the study area. Long-term changes will be evaluated by comparing data collected by this study to historical data collected by DWR from 1975 to the present.

Applicant Qualifications:

Leo Winternitz has a graduate degree in Environmental Management and is currently an Environmental Program Manager I with DWR. His relevant experience includes: administering major portions of the \$2 million Sacramento-San Joaquin Ecological Studies Project Agreement between DWR and DFG; participating as a member of the Delta Native Fishes Recovery Team chaired by Dr. Peter Moyle whereby recovery objectives for seven species of native fish were developed; acting as DWR's program manager for the Prospect Island Restoration Project; supervising the Interagency Program Section of the Ecological Studies Branch within DWR for five years; and currently overseeing the Monitoring and Analysis Branch of DWR's Environmental Services Office which includes the Bay-Delta Section and the Water Quality Control Systems Section.

Principal investigators of each of the monitoring elements were selected based on their areas of expertise. They include environmental specialists from DWR, a statistician from USGS and an aquatic biologist from Hydrozoology, Inc.

Budget Costs and Third Party Impacts:

Overall cost for this proposed study is \$211,960. However, combining this proposed study with DWR's in place Water Quality Monitoring Program results in a cost savings of \$64,161, due to savings in boat time, sample analysis, materials, and staffing. Therefore, we are requesting that Category III fund the remaining \$147,799 of this study. There are no known adverse impacts to third parties.

Local Support/Coordination with Other Programs/Compatibility with CALFED Objectives:

All counties in which this study will take place have been notified by letter of our intent to submit a proposal. Through the Interagency Ecological Program monitoring will be coordinated between this project and various project work teams. This study will be closely linked to the D-1485 Water Quality Monitoring Program conducted by the Department of Water Resources, Department of Fish and Game and the U.S. Bureau of Reclamation. This relationship involves the use of identical benthic sampling procedures, as well as equipment and personnel. Long-term benthic data obtained from the D-1485 program will be compared with data gathered by this project and used to establish impacts from the mitten crab. This mitten crab study will also collaborate with the Chinese Mitten Crab Habitat Use Project scheduled for implementation by DWR (with funding from IEP) starting in spring 1999.

Mitten crab monitoring described in this proposal is compatible with CALFED's ecological objectives in that it will examine the effects on food-web production by a non-native invasive species. This project will provide initial data on feasible means of non-destructive capture and control of mitten crabs, and will improve our understanding of how this invasive aquatic organism is affecting the ecological processes and species interactions within the Sacramento-San Joaquin Delta.

This project will also provide benefits for CALFED's non-ecosystem objectives by providing useful information for water pumping facilities on potential crab control measures and crab distribution and movement within the Delta. It may also provide useful information regarding distribution for individuals and organizations looking into the effects of burrowing mitten crabs on levee integrity.

I. TITLE PAGE

A. **Title of Project:** An Evaluation of the Potential Impacts of the Chinese Mitten Crab (*Eriocheir sinensis*) on the Benthic Community in the Sacramento-San Joaquin Delta and Suisun Bay

B. **Applicant:** Leo Winternitz
Address: Department of Water Resources
3251 "S" Street
Sac. CA 95816
Phone: (916) 227-7548
Fax: (916) 227-7554
E-Mail: lwintern@water.ca.gov

C. **Participants/Collaborators:**

Leo Winternitz-	DWR
Katie Wadsworth -	DWR
Cindy Messer -	DWR
Andrea Atkinson -	USGS
Wayne Fields -	Hydrozoology, Inc.

D. **Type of Organization/Tax Status:**

State Agency

II. Project Description

This project will determine if the Chinese mitten crab (*Eriocheir sinensis*) is having adverse impacts on benthic diversity and abundance in the Sacramento-San Joaquin Delta and Suisun Bay. Information on crab abundance and distribution obtained from this program will help in the overall effort to determine where large numbers of these organisms congregate in the Delta. This information will aid future control efforts undertaken to limit the number of crabs inhabiting the Delta.

The primary objective of this study is to determine whether the presence of the Chinese mitten crab (*Eriocheir sinensis*) in the Sacramento-San Joaquin Delta and Suisun Bay has an adverse effect on benthic invertebrate species diversity and abundance. Secondary objectives of this study are to determine mitten crab abundance within the study area and to test the efficiency of different gear types for catching crabs. This study will collect benthic data over a fourteen-month period and compare it with historical data (going back to 1975) collected by DWR. The study will attempt to detect short-term and long-term changes in the benthos. Short-term changes will be evaluated by comparing data before, during and after migration of the crabs through the study areas. Long-term changes will be determined by comparison of data collected

by this study to historical data. Data will also be collected on crab abundance within each of our study sites. This information will be used to explain changes in benthos diversity and abundance and will be available to other investigators for use in determining seasonal distribution of the mitten crab within the delta. Project sampling will consist of both benthos sampling and mitten crab sampling.

Benthic samples will be obtained using a Ponar Dredge (area of 0.053 m²). Ponar sampling will consist of 6 grabs from each of the 9 sites on a monthly basis. Much of these data are collected as part of DWR's Decision 1485 monthly water quality monitoring program. Sampling procedures will be identical to those of the D-1485 monitoring program in order to allow comparison of current and historical data. Benthos collected in the Ponar dredge will be washed over a 30-mesh screen (0.595 mm openings), with materials remaining on the screen being washed into a collection jar, preserved in 50% formalin, and stained using Rose Bengal dye. Organisms will be handpicked out of the remaining substrate and placed in 70% ethyl alcohol. Each organism will be identified to species when possible by an outside, contracted laboratory, Hydrozoology Inc. Direct impacts to the benthic community will be evaluated using an enclosure study. The enclosure study will consist of 2-3 bottomless cages set at several of the study sites. These cages will be stocked with various densities of mitten crabs (0-3 crabs/cage) and left out for varying amounts of time. The cages will be collected at the end of the specified time, the crabs killed and a benthic sample collected. All benthos collected will be preserved and identified using the procedure above. Stomach content analysis on a small number of mitten crabs will be attempted in order to obtain gross estimates of the amount of animal matter (versus vegetation) present. Stomach contents will be preserved in 50% formalin and stained using Rose Bengal dye. Wayne Fields of Hydrozoology, Inc. will perform this analysis.

Water quality data for seven of the proposed sites will come from DWR's Compliance Monitoring sampling activities. The two additional sites (Franks Tract and Sherman Lake) which were eliminated from the program in 1995 will be re-integrated into the Department's monthly sampling efforts. Physical data will include water temperature, specific conductance, dissolved oxygen, turbidity and substrate type.

Sampling for crabs will be conducted using a combination of modified crab traps and an otter trawl. Traps will be set out for three consecutive days each month and will be checked every 24 hours. Otter trawling will be conducted once a month and will coincide with trap deployment. Two ten-minute trawls will be conducted at each site. All crabs collected will be measured (maximum carapace width in mm), sexed and evaluated with regard to reproductive status. Mark and recapture efforts will be conducted to establish relative crab abundance at the study sites. All fish collected will be identified and measured (fork length in mm) and macroinvertebrates collected will be identified and counted.

A. Proposed Scope of Work

All tasks to be conducted during the course of this investigation are summarized in the table below. Deliverables will include quarterly reports published in the IEP newsletter and a final report to CALFED. Data collection will begin in November 1999 and will last through December 2000. All tasks mentioned below are inseparable.

Task	Sub-Tasks	Sampling Schedule
Mitten Crab Monitoring	A) Quantify crab use at each	November 1999-December 2000.

	study site. B) Test gear efficiency for crab capture and possible methods of control.	Monthly sampling will coincide with benthic sampling.
Benthic Monitoring	A) Evaluate benthic species composition and abundance before, during and after adult crab migration. B) Evaluate long-term trends of benthos diversity and abundance C) Evaluate substrate composition.	November 1999-December 2000. Monthly sampling.
Water Quality Monitoring	A) Characterize water quality conditions in perennial subtidal, open water and delta slough habitats. B) Characterize water quality conditions that coincide with crab presence.	November 1999-December 2000. Monthly sampling.
Project Management	A) Inspection of work in progress, validation of costs, preparation and review of reports and responses to project specific questions.	Ongoing throughout the period November 1999 to December 2000.

B. Location and /or Geographic Boundaries of Project

The study sites are located in Solano, Sacramento, Contra Costa and San Joaquin counties. Both Sacramento and San Joaquin River watersheds are included within the study area. See attached map at the end of this package for project boundary. Geographic coordinates of the proposed study sites are:

<u>Site Number</u>	<u>Site Name</u>	<u>Longitude*</u>	<u>Latitude*</u>
C9	West Canal at the intake to Clifton Court	-121.5525	37.8306
D4	Sacramento River above Sacramento Pt.	-121.8194	38.0625
D6	Bulls Head Point in Suisun Bay	-122.1167	38.0444
D7	Grizzly Bay in Suisun Marsh area	-122.0386	38.1172
D11	Sherman Lake near Antioch	-121.7928	38.0428
D19	Franks Tract near Bethel Island	-121.6136	38.0439
D24	Sacramento River below the Rio Vista Br.	-121.6836	38.1575
D28A	Old River channel near Bacon Island	-121.5719	37.9706
P8	Buckley Cove in the San Joaquin River	-121.3819	37.9783

* In decimal degrees

III. Ecological/Biological Benefits

This project will provide information regarding the relationship between the Chinese mitten crab (*Eriocheir sinensis*) and the benthic invertebrate community within the Sacramento-San Joaquin Delta and Suisun Bay. Benthic invertebrates make-up a large part of the aquatic food web. Information obtained from this project will help in the determination of the total distribution and relative abundance of the crab within these ecological systems. Collaboration with the DWR's long-term benthic monitoring project will help determine what changes have occurred in benthic species abundance and diversity as a result of the presence of mitten crabs. The study will determine short-term changes that occur to the benthic community due to the mass migration of adult crabs from freshwater to saline regions. Other benefits include, looking at the efficiency of different gear types for collecting mitten crabs, which may lead to feasible means of controlling or eradicating this invasive species. Finally, the diverse nature of the study sites, as well as the number of different habitat types these sites represent within the study area, should help to further our knowledge of habitat preference by migrating and resident mitten crabs. This project will provide information regarding the relationship of the mitten crab to a native species of grass shrimp (*C. franciscorum*) which supports a small commercial fishery in the system.

Benthic invertebrates comprise a large part of the Delta aquatic food web. Adverse impacts to this invertebrate food supply may impact survival and productivity of fish and shorebirds. Both native and non-native priority species that may be affected include: chinook salmon, striped bass, white sturgeon, signal crayfish, grass shrimp, splittail and warmwater game fish (ERPP, Volume 1 pp.349-350).

Third parties that may benefit from potential control measures for the crab include sport and commercial fishermen (grass shrimp and crayfish) and the State and Federal water pumping facilities which currently face problems associated with fish salvage due to out-migrating adult mitten crabs.

This project is needed to determine the relationship that exists between the mitten crab and the benthic invertebrate community of the Bay-Delta. Since the mitten crab is a new species to the system, little research has been done on this organism. This study will help to establish the abundance and distribution of the crab within our study area, as well as analyze potential control methods for the species. Parts of this proposal were based on Grosholz and Ruiz (1995) study of green crabs, which looked at green crab distribution, and potential impacts of green crabs to coastal embayments of western North America.

The primary stressor which is the focus of this study is the mitten crab an invasive aquatic organism which may be competing with native (and valuable non-native) organisms for food, and serving as a direct predator on these species. Primary habitats, which will be the focus of this project, include: tidal perennial aquatic habitat, delta sloughs, shoals, and freshwater habitat.

The scientific hypothesis that will be evaluated by this project is; the Chinese mitten crab has an adverse effect on benthos species diversity and abundance within the Sacramento-San Joaquin Delta and the Suisun Marsh regions.

This project implements an ecosystem-based approach by serving as a Stage I targeted research project as stated on page 19 of the CALFED Strategic Plan for Ecosystem Restoration (1999). It serves as the first stage in an adaptive management framework, which is to define specific problems which affect the health of the ecosystem. Through this study we will investigate the relationship between the mitten crab and the benthic invertebrate organisms within the Bay-Delta ecosystem. This project will provide information on crab distribution and

habitat preference, which will be valuable information for future and current restoration efforts. Gear efficiency information will also aid in determining feasible control and eradication efforts for future phases of this project.

This study will have linkages to several ongoing and future projects. This study will be closely tied to the D-1485 Water Quality Monitoring Program conducted by DWR, Department of Fish and Game and the U.S. Bureau of Reclamation by incorporating identical benthic sampling procedures as well as, equipment and personnel. Long-term benthic data obtained from the D-1485 program will be compared with data gathered by this project and used to establish long-term impacts. This mitten crab study will also collaborate with IEP's Chinese Mitten Crab Habitat Use Study that begins in Spring 1999. Information gathered on relative abundance, distribution and food preferences of this crab will be shared with the Department of Fish and Game which is currently keeping track of mitten crab movement in the Bay-Delta ecosystem. Gear efficiency information and control measure recommendations will be shared with State and Federal pumping plants that currently face serious problems with regard to fish salvage during peak out-migration of adult mitten crabs. Finally, data collected during this study will also be shared with individuals and/or organizations interested in determining the impacts of burrowing mitten crabs on levee integrity.

Restoration programs mentioned in Volume I of the Ecosystem Restoration Program Plan: Vision for Invasive Aquatic Organisms (pp. 463, February 1999) will also have access to data gathered from this study and will be consulted for support and suggestions regarding the direction of this study.

This project will provide benefits for CALFED's non-ecosystem objectives by providing useful information for water pumping facilities on potential crab control measures and crab distribution and movement within the Delta. This study may also provide some useful information for individuals and /or organizations interested in determining the impacts of burrowing mitten crabs on levee integrity.

Table 1: Ecological/Biological Goals

ERP Strategic Objectives/Targets	Volume Number	Page Number (s)
Restore primary and secondary food-web production levels, by seeking to eliminate adverse effects of introduced aquatic species.	I	30, 40
	II	155
Reduce competition for food and habitat and direct predation of key species by introduced aquatic species.	I	40, 421, 423, 463
	II	45
Reduce impacts to key species such as striped bass, chinook salmon and delta smelt.	I	96, 352, 460
Lessen impacts and improve numbers of commercial species such as signal crayfish and grass shrimp.	I	414, 417, 418
	II	45
Develop feasible and non-	I	353, 462, 467

destructive means of control for introduced species.	II	81
Reduce adverse effects of stressors and/or eliminate stressors.	I	420, 422
Understand how invasive aquatic organisms affect ecological processes and interactions.	I	462

IV. Technical Feasibility and Timing

Several alternatives were examined for collecting crabs; these included using a beam trawl, crab dredge and beach seining. The beam trawl and crab dredge will not be used in this study because they are more appropriate for sampling small areas with little or no vegetation. Beach seining is not appropriate due to the lack of solid bank areas in some of the sites, as well as danger associated with strong currents. Crab collection will be conducted using an otter trawl and modified crab traps. The otter trawl was selected because it will sample a fairly large area and is able to sample through moderate vegetation. Traps were selected as a means of sampling vegetated areas and may provide a better method for capturing crabs inhabiting the edges of the sample sites. Environmental permits that are currently being obtained or amended include Scientific Collecting Permits and an amendment to the NMFS Section 10 permit. A Restricted Species Permit has already been obtained for the department. The Department of Fish and Game and the U.S. Fish and Wildlife Service will be contacted and provided with all necessary documentation associated with this project proposal.

There appear to be no other outstanding issues, which would prevent implementation of this proposed study.

V. Monitoring and Data Collection Methodology

All primary objectives are summarized in Table 2 below. This is the initial phase of the project and will entail preliminary and monthly monitoring. This project will be integrated with DWR's D-1485 Water Quality Monitoring Program which conducts monthly benthic sampling in the Sacramento-San Joaquin Delta, San Pablo and Suisun Bays. Additional benthic samples will be obtained by DWR personnel for the purpose of this study. Water quality data will also be provided by these monthly efforts. Coordination between this project and the IEP Mitten Crab Habitat Use Project will include crab trap design, data exchange for habitat use, gear efficiency and relative crab abundance.

Ponar sampling protocol can be found in Hymanson, et al (1994). Otter trawling protocol is based on that used by the UC Davis Suisun Marsh fish study. This protocol can be found at Internet site:

<http://www iep. water. ca. gov/ ucdfish/ adoc.>

Reporting will consist of quarterly updates for the IEP newsletter and an annual report to CALFED. Benthic data will be made available on the IEP comprehensive database for public

access (<http://www.iep.ca.gov>). The mitten crab data will be stored in DWR's Monitoring and Analysis Branch database. Data will be used for technical reports and for exchange with other agencies and interested persons. Various IEP Project Work Teams (Mitten Crab and Shallow-water Habitat) and projects such as the IEP Mitten Crab Habitat Study, Kathy Hieb of the Department of Fish and Game and other interested parties (ie. UC Davis, USGS, etc) will provide peer review of this study.

Table 2. Monitoring Parameters

Question to be Evaluated/Hypothesis	Monitoring Parameter (s) and Data Collection Approach	Data Evaluation Approach	Comments/ Study Priority
Mitten crabs are having an adverse effect on benthic invertebrate diversity and abundance.	Evaluate benthic species composition and abundance over time. Data collection includes use of Ponar dredge and follows DWR's D-1485 monthly benthic sampling protocol. A total of 54 samples will be collected monthly and analyzed. An enclosure study will also be conducted using 2-3 cages at 2 sites. Crab densities per cage will vary. Benthic samples will follow the above protocol.	Long-term trend analysis will be conducted by comparing data gathered in this study with historical data. Short-term trend analysis will use data gathered before, during and after adult crab migration. Multiple linear regression and F-test statistical analyses will be used. Data analyses and reports written will follow IEP QA/QC requirements.	High
Mitten crab stomach content analysis will provide insight into aquatic foodweb prey species.	Identify and enumerate species present in crab stomachs. 10-15 crabs will be collected monthly (when possible). Data collection includes use of 3 - 4 crab traps per site and an otter trawl. Crabs will be killed, stomachs removed and preserved in formalin.	Wayne Fields of Hydrozoology, Inc. will identify and enumerate benthic species. Data will be analyzed and reported according to IEP QA/QC protocol.	High
Quantify relative crab abundance and distribution among study areas. Note preferred habitats.	Monthly monitoring of juvenile and adult crab lifestages. Data collection will include use of otter trawls and crab traps. Two 5-10 minute trawls will be done at each site. 3-4 traps will also be set at each site monthly.	Mark/recapture exercises and total crabs caught per site will be used to determine relative abundance at each site. All crabs caught will be measured and sexed. All data collected, analyzed and reported will follow IEP QA/QC guidelines.	High
Investigate relationship between mitten crab and grass shrimp species (<i>C. franciscorum</i>) and signal crayfish (<i>P. leniusculus</i>) at study areas where these species are found.	Monthly otter trawls and stomach content analysis should provide information regarding shrimp and crayfish presence and role as food source for crabs.	All macroinvertebrates collected in otter trawl will be identified and counted. See stomach content analysis above. Data collected, analyzed and reported will follow IEP QA/QC guidelines.	High
Determine feasible and non-destructive means for capture	Conduct gear efficiency trials using marked (or tagged) crabs.	All data collected, analyzed and reported will follow IEP QA/QC	High

(and possibly control) of crabs.	Gear types include traps and an otter trawl.	guidelines.	
Determine water quality conditions associated with different habitats (open water, slough, sub-tidal) and with presence/absence of crabs.	Monitoring parameters will include water temperature, specific conductance, dissolved oxygen and turbidity. Data will be collected monthly.	All data collected, analyzed and reported will follow IEP QA/QC guidelines.	High

VI. Local Involvement

Letters of notification have been sent to both the County Board of Supervisors and the County Planning Departments of Solano, Contra Costa, Sacramento and San Joaquin Counties. Please see attached copies.

Overall local awareness of the Chinese mitten crab has grown considerably in the last few years due to media coverage in local newspapers (Sacramento Bee, the Daily Republic-Fairfield, the Stockton Record and the San Francisco Examiner) and local television stations (Channel 3). Several environmental non-profit groups (San Francisco Estuary Institute and the Delta Protection Commission) have been made aware of this issue via the Department of Fish and Game.

Through the IEP Mitten Crab Project Work Team, the Skinner and Tracy fish facilities are aware of this proposed study. Data from our project will be made available to the IEP project work teams and to the general public. The IEP website (<http://www.iep.ca.gov>) will be the primary means of getting information to the public. One of the goals of the IEP Mitten Crab Project Work Team is to provide information to local farmers and landowners regarding the mitten crab.

There appear to be no third party impacts associated with this study.

VII. Cost

Table 3. Total Budget

Project Task	Direct Labor (Hrs)	Direct Salary and Benefits	Service Contract	Material and Acquisition	Misc and other direct costs	Overhead and Indirect Costs	Total Cost
Mitten Crab Monitoring	560	12,622	0	5,000	16,000	3,029	37,211
Benthic Monitoring	560	12,622	43,120	0	0	3,029	59,331
Gear Efficiency	280	3,763	0	0	0	903	4,946
Enclosure Study	280	3,763	0	0	0	903	4,946
Water Quality Monitoring	560	11,799	0	0	0	2,832	15,191

Data Entry	448	8,059	0	0	0	1,934	10,441
Data Analysis	120	1,936	0	0	0	465	2,521
Report Preparation	200	6,518	0	0	0	1,564	8,283
Project Management	112	3,884	0	0	0	932	4,928
Total	3,120	64,967	43,120	5,000	16,000	15,592	147,799

Table 4. Quarterly Budget

Project Task	Quarterly Budget Oct-Dec 99	Quarterly Budget Jan-Mar 00	Quarterly Budget Apr-June 00	Quarterly Budget Jul-Sept 00	Quarterly Budget Oct-Dec 00	Total Budget
Mitten Crab Monitoring	10,882	6,582	6,582	6,582	6,583	37,211
Benthic Monitoring	11,866	11,866	11,866	11,866	11,867	59,331
Gear Efficiency	989	989	989	989	989	4,946
Enclosure Study	989	989	989	989	989	4,946
Water Quality Monitoring	3,038	3,038	3,038	3,038	3,038	15,191
Data Entry	2,088	2,088	2,088	2,088	2,088	10,441
Data Analysis	0	0	0	0	2,521	2,522
Report Preparation	0	0	0	0	8,283	8,283
Project Management	986	986	986	986	986	4,928
Total	30,839	26,539	26,539	26,539	37,345	147,799

All monitoring elements will begin in November 1999 and conclude in December 2000. This proposal summarizes four monitoring elements. All elements are interrelated, and therefore, funding for all four is necessary in order to achieve a complete ecological evaluation.

VIII. Cost-Sharing

The overall cost of this proposed study is \$211,960. However, combining this proposed study with DWR's in place Water Quality Monitoring Program results in a cost savings of \$64,161, due to a savings in boat time, sample analysis, material acquisition and staffing. Therefore, we are requesting that Category III fund the remaining \$147,799 of this study. If Category III is only able to fund a portion of the \$147,799, additional cost sharing may be obtained from IEP and DWR. The cost of supplies for constructing crab traps will be shared between this project and IEP's Mitten Crab Habitat Use study.

IX. Applicant Qualifications

Program Coordination

Leo Winternitz (DWR) is the program coordinator. He will coordinate the individual monitoring elements. Although the principal investigators are responsible for reporting on the individual elements, the program coordinator will integrate all elements into comprehensive annual reports.

Leo Winternitz: B.S. and M.S. in Environmental Science. Environmental Program Manager I with DWR. Relevant experience includes: administering major portions of the \$2 million Sacramento-San Joaquin Ecological Studies Project Agreement between DWR and DFG; participating as a member of the Delta Native Fishes Recovery Team chaired by Dr. Peter Moyle whereby recovery objectives for seven species of native fish were developed; acting as DWR's program manager for the Prospect Island Restoration Project; supervising the Interagency Section of the Ecological Studies Branch within DWR for five years; and currently overseeing the Monitoring and Analysis Branch of DWR's Environmental Services Office which includes the Bay-Delta Section and the Water Quality Control Systems Section.

Water Quality

Fieldwork to be conducted by one DWR Control Systems Engineer, one biologist and one scientific aide. Data analysis and report writing will be prepared by Katie Wadsworth (DWR).

Katie Wadsworth: M.S. Environmental Science and B.S. Environmental Biology. Environmental Specialist III. 7 years experience in the Delta, including the design, collection, analysis and interpretation of data. Principle investigator for water quality section of Prospect Island Monitoring project.

Benthic Community and Mitten Crab Monitoring

Field work to be conducted by one DWR biologist and one scientific aide.
Lab work to be conducted by Wayne Fields, Hydrozoology, Inc.

Cindy Messer: B.S. Environmental Policy Analysis and Planning.
Environmental Specialist, DWR. Lead biologist for the DWR D-1485 water quality and benthic monitoring project. Principle investigator for benthic monitoring aspect of the Prospect Island Monitoring project.

Wayne Fields: M.S. and B.S. Biological Conservation.
Owner, Hydrozoology, Inc. Responsible for identification and enumeration of all taxa found in DWR's D-1485 benthic samples. Over 20 years experience in identification of aquatic macroinvertebrates of the Sacramento-San Joaquin Delta, Marin County, Monterey County, Santa Cruz and Alameda counties.

Data Reduction and Analysis

Andrea Atkinson: Ph.D. Ecology, B.S. Biology
Statistician, USGS-BRD
Support staff for developing CALFED's CMARP (Comprehensive Monitoring, Assessment, and Research Program) with experience in statistical ecology.

X. References

- 1) Grosholz, E.D., and G.M Ruiz., 1995, Spread and potential impact of the recently introduced European green crab, *Carcinus maenas*, in central California. Marine Biology 122:239-247
- 2) Hymanson, Z., D. Mayer, and J. Steinbeck, 1994, IEP Technical Report 38, Long-Term Trends in Benthos Abundance and Persistence in the Upper Sacramento-San Joaquin Estuary, Summary 1980-1990.
- 3) CALFED Bay-Delta Program, Ecosystem Restoration Program Plan, February 1999, pp. 349-350 and 463.

Attachment D: Terms and Conditions for State (CALFED) Funds

According to Table D-1: Standard Contract Clauses and Related Proposal Submittal Requirements, as a state agency, we are not required to submit any items listed in the table with this proposal. Item 1487: Interagency Agreements will be submitted at time of final contract.

Attachment E: Terms and Conditions for Federal (Department of Interior) Funds

See attached forms:

DI-2010
Standard Form 424
424A
424B

U.S. Department of the Interior

**Certifications Regarding Debarment, Suspension and
Other Responsibility Matters, Drug-Free Workplace
Requirements and Lobbying**

Persons signing this form should refer to the regulations referenced below for complete instructions:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions - The prospective primary participant further agrees by submitting this proposal that it will include the clause titled, "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions. See below for language to be used; use this form for certification and sign; or use Department of the Interior Form 1954 (DI-1954). (See Appendix A of Subpart D of 43 CFR Part 12.)

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions - (See Appendix B of Subpart D of 43 CFR Part 12.)

Certification Regarding Drug-Free Workplace Requirements - Alternate I. (Grantees Other Than Individuals) and Alternate II. (Grantees Who are Individuals) - (See Appendix C of Subpart D of 43 CFR Part 12)

Signature on this form provides for compliance with certification requirements under 43 CFR Parts 12 and 18. The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of the Interior determines to award the covered transaction, grant, cooperative agreement or loan.

**PART A: Certification Regarding Debarment, Suspension, and Other Responsibility Matters -
Primary Covered Transactions**

CHECK IF THIS CERTIFICATION IS FOR A PRIMARY COVERED TRANSACTION AND IS APPLICABLE.

- (1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
 - (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
 - (b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
 - (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- (2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

**PART B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -
Lower Tier Covered Transactions**

CHECK IF THIS CERTIFICATION IS FOR A LOWER TIER COVERED TRANSACTION AND IS APPLICABLE.

- (1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- (2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

DI-2914
March 1981
(This form supersedes the DI-1952, DI-1954,
DI-1955, DI-1956 and DI-1957)

PART E: Certification Regarding Lobbying
Certification for Contracts, Grants, Loans, and Cooperative Agreements

CHECK IF CERTIFICATION IS FOR THE AWARD OF ANY OF THE FOLLOWING AND THE AMOUNT EXCEEDS \$100,000: A FEDERAL GRANT OR COOPERATIVE AGREEMENT; SUBCONTRACT, OR SUBGRANT UNDER THE GRANT OR COOPERATIVE AGREEMENT.

CHECK IF CERTIFICATION IS FOR THE AWARD OF A FEDERAL LOAN EXCEEDING THE AMOUNT OF \$150,000, OR A SUBGRANT OR SUBCONTRACT EXCEEDING \$100,000, UNDER THE LOAN.

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

As the authorized certifying official, I hereby certify that the above specified certifications are true.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL

TYPED NAME AND TITLE Dr. Randall L. Brown, Chief, Environmental Services Office

DATE

APPLICATION FOR FEDERAL ASSISTANCE

OMB Approval No. 0348-0043

1. TYPE OF SUBMISSION: Application <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Non-Construction		2. DATE SUBMITTED 	Applicant Identifier N/A
Preapplication <input type="checkbox"/> Construction <input type="checkbox"/> Non-Construction		3. DATE RECEIVED BY STATE N/A	State Application Identifier N/A
		4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier

5. APPLICANT INFORMATION

Legal Name: CA. Dept. of Water Resources Address (give city, county, State, and zip code): 3251 "S" Street Sacramento County Sacramento, CA 95816	Organizational Unit: Environmental Services Office Name and telephone number of person to be contacted on matters involving this application (give area code): Leo Winternitz (916) 227-7548
---	---

6. EMPLOYER IDENTIFICATION NUMBER (EIN):

9	4	-	6	3	5	5	5	7	0
---	---	---	---	---	---	---	---	---	---

7. TYPE OF APPLICANT: (enter appropriate letter in box)

A. State B. County C. Municipal D. Township E. Interstate F. Intermunicipal G. Special District	H. Independent School Dist. I. State Controlled Institution of Higher Learning J. Private University K. Indian Tribe L. Individual M. Profit Organization N. Other (Specify) _____
---	--

8. TYPE OF APPLICATION:
☒ New ☐ Continuation ☐ Revision
If Revision, enter appropriate letter(s) in box(es) ☐ ☐

A. Increase Award	B. Decrease Award	C. Increase Duration
D. Decrease Duration Other (specify): _____		

9. NAME OF FEDERAL AGENCY:
 US Fish and Wildlife Service

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER:

		-			
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TITLE: N/A

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
 An Evaluation of the Impacts of the Chinese Mitten Crab (*E. sinensis*) on the Benthic Community in the Sacramento-San Joaquin Delta.

12. AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.):
 Solano, Sacramento, San Joaquin, Contra Costa

13. PROPOSED PROJECT <table style="width: 100%;"> <tr> <td style="width: 50%;">Start Date 11/99</td> <td style="width: 50%;">Ending Date 12/00</td> </tr> </table>	Start Date 11/99	Ending Date 12/00	14. CONGRESSIONAL DISTRICTS OF: <table style="width: 100%;"> <tr> <td style="width: 50%;">a. Applicant 3, 5</td> <td style="width: 50%;">b. Project 3</td> </tr> </table>	a. Applicant 3, 5	b. Project 3
Start Date 11/99	Ending Date 12/00				
a. Applicant 3, 5	b. Project 3				

15. ESTIMATED FUNDING: <table style="width: 100%;"> <tr> <td style="width: 30%;">a. Federal</td> <td style="width: 70%;">\$ 147,799.⁰⁰</td> </tr> <tr> <td>b. Applicant</td> <td>\$.⁰⁰</td> </tr> <tr> <td>c. State</td> <td>\$.⁰⁰</td> </tr> <tr> <td>d. Local</td> <td>\$.⁰⁰</td> </tr> <tr> <td>e. Other</td> <td>\$.⁰⁰</td> </tr> <tr> <td>f. Program Income</td> <td>\$.⁰⁰</td> </tr> <tr> <td>g. TOTAL</td> <td>\$ 147,799.⁰⁰</td> </tr> </table>	a. Federal	\$ 147,799. ⁰⁰	b. Applicant	\$. ⁰⁰	c. State	\$. ⁰⁰	d. Local	\$. ⁰⁰	e. Other	\$. ⁰⁰	f. Program Income	\$. ⁰⁰	g. TOTAL	\$ 147,799. ⁰⁰	16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS? a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON: DATE _____ b. No. <input type="checkbox"/> PROGRAM IS NOT COVERED BY E. O. 12372 <input type="checkbox"/> OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW
a. Federal	\$ 147,799. ⁰⁰														
b. Applicant	\$. ⁰⁰														
c. State	\$. ⁰⁰														
d. Local	\$. ⁰⁰														
e. Other	\$. ⁰⁰														
f. Program Income	\$. ⁰⁰														
g. TOTAL	\$ 147,799. ⁰⁰														

17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT?
☐ Yes If "Yes," attach an explanation. ☐ No

18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.

a. Type Name of Authorized Representative Dr. Randall L. Brown	b. Title Environmental Serv. Chief, Office	c. Telephone Number (916) 227-7531
d. Signature of Authorized Representative		e. Date Signed

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Standard Form 424 (Rev. 7-97)
Prescribed by OMB Circular A-102

BUDGET INFORMATION - Non-Construction Programs

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Monitoring		\$	\$	\$ 147,799	\$	\$ 147,799
2.						
3.						
4.						
5. Totals		\$	\$	\$ 147,799	\$	\$
SECTION 2 - INDIRECT CHARGES						
6. Object Class Categories		GRANT PROGRAM, FUNCTION OR ACTIVITY				Total (5)
		(1)	(2)	(3)	(4)	
a. Personnel		\$	\$	\$ 68,087	\$	\$
b. Fringe Benefits						
c. Travel						
d. Equipment				5,000		
e. Supplies						
f. Contractual				43,120		
g. Construction						
h. Other				31,592		
i. Total Direct Charges (sum of 6a-6h)						
j. Indirect Charges						
k. TOTALS (sum of 6i and 6j)		\$	\$	\$ 147,799	\$	\$
7. Program Income		\$	\$	\$	\$	\$

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Standard Form 424A (Rev. 4-92)
Prescribed by OMB Circular A-102

1-019629

1-019629

SECTION 10 - NON-FEDERAL RESOURCES					
(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS	
8.	\$	\$	\$	\$	
9.					
10.					
11.					
12. TOTAL (sum of lines 8 - 11)	\$	\$	\$	\$	
SECTION 11 - FEDERAL FUNDS					
Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
13. Federal	\$	\$	\$	\$	
14. Non-Federal					
15. TOTAL (sum of lines 13 and 14)					
SECTION 12 - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR FISCAL YEAR 2000					
(a) Grant Program	FUTURE FUNDING PERIODS (Years)				(e) Fourth
	(b) First	(c) Second	(d) Third		
16. November 01, 1999 - December 31, 2000	\$ 147,799	\$	\$	\$	
17.					
18.					
19.					
20. TOTAL (sum of lines 16-19)	\$ 147,799	\$	\$	\$	
SECTION 13 - DIRECT CHARGES					
21. Direct Charges:	147,799	22. Indirect Charges:			
23. Remarks:					

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Standard Form 424A (Rev. 4-82) Page 2

ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

**PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET.
SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.**

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE Chief, Environmental Services Office
APPLICANT ORGANIZATION California Department of Water Resources	DATE SUBMITTED

Standard Form 424B (Rev. 7-97) Back

DEPARTMENT OF WATER RESOURCES

ENVIRONMENTAL SERVICES OFFICE
3261 S STREET
SACRAMENTO, CA 95816-7017



April 8, 1999

Clerk of the Board
County Board of Supervisors
Solano County
580 Texas Street
Fairfield, CA 94533

Dear Clerk of the Board,

This letter is to notify you that our department will be submitting a proposal to the CALFED Bay-Delta Program. This proposal includes environmental monitoring which will take place within Solano County. As part of CALFED's Proposal Solicitation Package (PSP) we are required to notify local government agencies of the nature of the study and where the study site(s) is located.

We are proposing to do a 14-month project that examines the impacts that the Chinese Mitten Crab (*Eriocheir sinensis*), a recently introduced species, is having on the benthic invertebrate community in the Sacramento-San Joaquin Delta and Suisun Bay. We will collect mitten crabs by boat, monthly, using a trawling net and a small number of crab traps (made from PVC and plastic mesh). All crabs caught will be measured and immediately placed back into the water. Benthic invertebrates will be collected as part of the Department of Water Resource's regularly scheduled monthly water quality sampling runs (Decision 1485 Water Quality Monitoring, started in 1977). This sampling method entails the use of a small Ponar dredge (area of .053 m²) to grab substrate from the bottom of the study site. Organisms are brought back to the lab, identified and enumerated.

The study area located within Solano County include: the Sacramento River above Sacramento Point, Bulls Head Point in the Suisun Bay, Grizzly Bay in Suisun Marsh and the Sacramento River below the Rio Vista Bridge.

Thank you for your time, if you have any questions please call me at (916) 227-7548.

Sincerely,

A handwritten signature in dark ink, appearing to read "Leo Winternitz", is written over a light-colored background.

Leo Winternitz
Environmental Program Manager

DEPARTMENT OF WATER RESOURCES

ENVIRONMENTAL SERVICES OFFICE
3251 S STREET
SACRAMENTO, CA 95816-7017



April 8, 1999

Birgitta Corsello
Department of Environmental Management
Solano County
601 Texas Street
Fairfield, CA 94533

Dear Ms. Corsello,

This letter is to notify you that our department will be submitting a proposal to the CALFED Bay-Delta Program. This proposal includes environmental monitoring which will take place within Solano County. As part of CALFED's Proposal Solicitation Package (PSP) we are required to notify local government agencies of the nature of the study and where the study site(s) is located.

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Thank you for your time, if you have any questions please call me at (916) 227-7548.

Sincerely,

A handwritten signature in black ink, reading "Leo Winternitz", is positioned above the typed name.

Leo Winternitz
Environmental Program Manager

DEPARTMENT OF WATER RESOURCES

ENVIRONMENTAL SERVICES OFFICE
3251 S STREET
SACRAMENTO, CA 95816-7017



April 8, 1999

Clerk of the Board
County Board of Supervisors
651 Pine St., Room 106
Martinez, CA 94553

Dear Clerk of the Board,

This letter is to notify you that our department will be submitting a proposal to the CALFED Bay-Delta Program. This proposal includes environmental monitoring which will take place within Contra Costa County. As part of CALFED's Proposal Solicitation Package (PSP) we are required to notify local government agencies of the nature of the study and where the study site(s) is located.

We are proposing to do a 14-month project that examines the impacts that the Chinese Mitten Crab (*Eriocheir sinensis*), a recently introduced species, is having on the benthic invertebrate community in the Sacramento-San Joaquin Delta and Suisun Bay. We will collect mitten crabs by boat, monthly, using a trawling net and a small number of crab traps (made from PVC and plastic mesh). All crabs caught will be measured and immediately placed back into the water. Benthic invertebrates will be collected as part of the Department of Water Resource's regularly scheduled monthly water quality sampling runs (Decision 1485 Water Quality Monitoring, started in 1977). This sampling method entails the use of a small Ponar dredge (area of .053 m²) to grab substrate from the bottom of the study site. Organisms are brought back to the lab, identified and enumerated.

The study areas located within Contra Costa County include; Franks Tract near Bethel Island and Old River channel near Bacon Island.

Thank you for your time, if you have any questions please call me at (916) 227-7548.

Sincerely,

Leo Winternitz
Environmental Program Manager

DEPARTMENT OF WATER RESOURCES

ENVIRONMENTAL SERVICES OFFICE
3251 S STREET
SACRAMENTO, CA 95816-7017



April 8, 1999

Dennis M. Barry
Community Development Department
651 Pine St., North Wing-4th Floor
Martinez, CA 94553

Dear Mr. Barry,

This letter is to notify you that our department will be submitting a proposal to the CALFED Bay-Delta Program. This proposal includes environmental monitoring which will take place within Contra Costa County. As part of CALFED's Proposal Solicitation Package (PSP) we are required to notify local government agencies of the nature of the study and where the study site(s) is located.

We are proposing to do a 14-month project that examines the impacts that the Chinese Mitten Crab (*Eriocheir sinensis*), a recently introduced species, is having on the benthic invertebrate community in the Sacramento-San Joaquin Delta and Suisun Bay. We will collect mitten crabs by boat, monthly, using a trawling net and a small number of crab traps (made from PVC and plastic mesh). All crabs caught will be measured and immediately placed back into the water. Benthic invertebrates will be collected as part of the Department of Water Resource's regularly scheduled monthly water quality sampling runs (Decision 1485 Water Quality Monitoring, started in 1977). This sampling method entails the use of a small Ponar dredge (area of .053 m²) to grab substrate from the bottom of the study site. Organisms are brought back to the lab, identified and enumerated.

The study areas located within Contra Costa County include; Franks Tract near Bethel Island and Old River channel near Bacon Island.

Thank you for your time, if you have any questions please call me at (916) 227-7548.

Sincerely,

A handwritten signature in black ink, reading "Leo Winternitz".

Leo Winternitz
Environmental Program Manager

DEPARTMENT OF WATER RESOURCES

ENVIRONMENTAL SERVICES OFFICE
3251 S STREET
SACRAMENTO, CA 95816-7017



April 8, 1999

Thomas W. Hutchings, Director
Planning and Community Development
827 7th Street, Room 230
Sacramento, CA 95814

Dear Mr. Hutchings,

This letter is to notify you that our department will be submitting a proposal to the CALFED Bay-Delta Program. This proposal includes environmental monitoring which will take place within Sacramento County. As part of CALFED's Proposal Solicitation Package (PSP) we are required to notify local government agencies of the nature of the study and where the study site(s) is located.

We are proposing to do a 14-month project that examines the impacts that the Chinese Mitten Crab (*Eriocheir sinensis*), a recently introduced species, is having on the benthic invertebrate community in the Sacramento-San Joaquin Delta and Suisun Bay. We will collect mitten crabs by boat, monthly, using a trawling net and a small number of crab traps (made from PVC and plastic mesh). All crabs caught will be measured and immediately placed back into the water. Benthic invertebrates will be collected as part of the Department of Water Resource's regularly scheduled monthly water quality sampling runs (Decision 1485 Water Quality Monitoring, started in 1977). This sampling method entails the use of a small Ponar dredge (area of .053 m²) to grab substrate from the bottom of the study site. Organisms are brought back to the lab, identified and enumerated.

The study area located within Sacramento County is Sherman Lake near Antioch.

Thank you for your time, if you have any questions please call me at (916) 227-7548.

Sincerely,

A handwritten signature in black ink, reading "Leo Winternitz". The signature is written in a cursive, flowing style.

Leo Winternitz
Environmental Program Manager

DEPARTMENT OF WATER RESOURCES

ENVIRONMENTAL SERVICES OFFICE
3251 S STREET
SACRAMENTO, CA 95816-7017



April 8, 1999

Cindy H. Turner
Clerk of the Board
County Board of Supervisors
700 H. Street, Suite 2450
Sacramento, CA 95814

Dear Ms. Turner,

This letter is to notify you that our department will be submitting a proposal to the CALFED Bay-Delta Program. This proposal includes environmental monitoring which will take place within Sacramento County. As part of CALFED's Proposal Solicitation Package (PSP) we are required to notify local government agencies of the nature of the study and where the study site(s) is located.

We are proposing to do a 14-month project that examines the impacts that the Chinese Mitten Crab (*Eriocheir sinensis*), a recently introduced species, is having on the benthic invertebrate community in the Sacramento-San Joaquin Delta and Suisun Bay. We will collect mitten crabs by boat, monthly, using a trawling net and a small number of crab traps (made from PVC and plastic mesh). All crabs caught will be measured and immediately placed back into the water. Benthic invertebrates will be collected as part of the Department of Water Resource's regularly scheduled monthly water quality sampling runs (Decision 1485 Water Quality Monitoring, started in 1977). This sampling method entails the use of a small Ponar dredge (area of .053 m²) to grab substrate from the bottom of the study site. Organisms are brought back to the lab, identified and enumerated.

The study area located within Sacramento County is Sherman Lake near Antioch.

Thank you for your time, if you have any questions please call me at (916) 227-7548.

Sincerely,

A handwritten signature in dark ink, reading "Leo Winternitz". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Leo Winternitz
Environmental Program Manager

DEPARTMENT OF WATER RESOURCES

ENVIRONMENTAL SERVICES OFFICE
3261 S STREET
SACRAMENTO, CA 95816-7017



April 8, 1999

Ms. Lois Sahyoun
Clerk of the Board
County Board of Supervisors
Courthouse, Room 701
222 East Weber Ave
Stockton, CA 95202

Dear Ms. Sahyoun,

This letter is to notify you that our department will be submitting a proposal to the CALFED Bay-Delta Program. This proposal includes environmental monitoring which will take place within San Joaquin County. As part of CALFED's Proposal Solicitation Package (PSP) we are required to notify local government agencies of the nature of the study and where the study site(s) is located.

We are proposing to do a 14-month project that examines the impacts that the Chinese Mitten Crab (*Eriocheir sinensis*), a recently introduced species, is having on the benthic invertebrate community in the Sacramento-San Joaquin Delta and Suisun Bay. We will collect mitten crabs by boat, monthly, using a trawling net and a small number of crab traps (made from PVC and plastic mesh). All crabs caught will be measured and immediately placed back into the water. Benthic invertebrates will be collected as part of the Department of Water Resource's regularly scheduled monthly water quality sampling runs (Decision 1485 Water Quality Monitoring, started in 1977). This sampling method entails the use of a small Ponar dredge (area of .053 m²) to grab substrate from the bottom of the study site. Organisms are brought back to the lab, identified and enumerated. The study areas located within San Joaquin County include; the west canal at the intake to the Clifton Court forebay and Buckley Cove in the San Joaquin River.

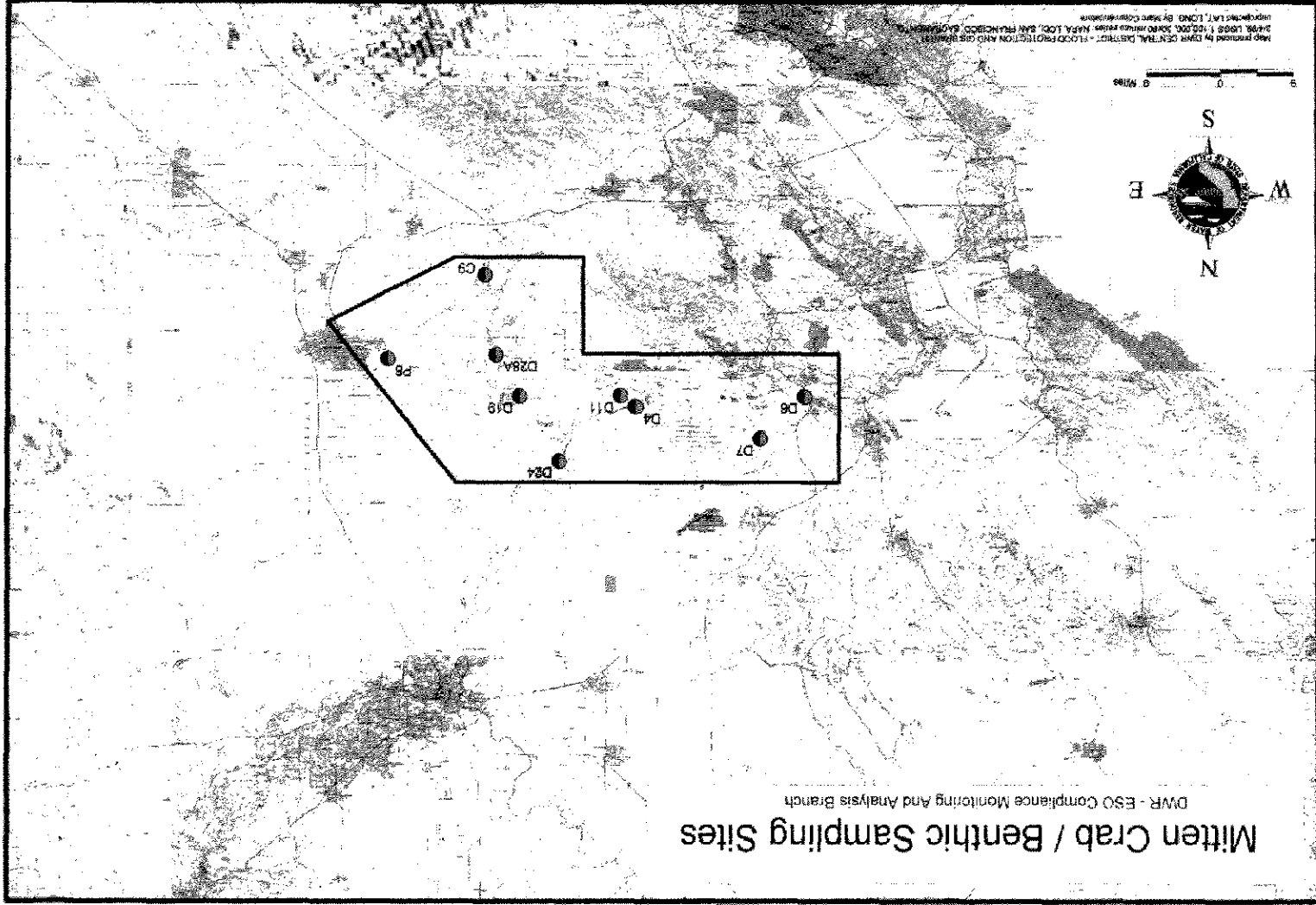
Thank you for your time, if you have any questions please call me at (916) 227-7548.

Sincerely,

Leo Winternitz
Environmental Program Manager

Mitten Crab / Benthic Sampling Sites

DWR - ESO Compliance Monitoring And Analysis Branch



Map prepared by DWR Central District - Flood Protection and Construction
 2008, 1998, 1995, 1992, 1989, 1986, 1983, 1980, 1977, 1974, 1971, 1968, 1965, 1962, 1959, 1956, 1953, 1950, 1947, 1944, 1941, 1938, 1935, 1932, 1929, 1926, 1923, 1920, 1917, 1914, 1911, 1908, 1905, 1902, 1899, 1896, 1893, 1890, 1887, 1884, 1881, 1878, 1875, 1872, 1869, 1866, 1863, 1860, 1857, 1854, 1851, 1848, 1845, 1842, 1839, 1836, 1833, 1830, 1827, 1824, 1821, 1818, 1815, 1812, 1809, 1806, 1803, 1800, 1797, 1794, 1791, 1788, 1785, 1782, 1779, 1776, 1773, 1770, 1767, 1764, 1761, 1758, 1755, 1752, 1749, 1746, 1743, 1740, 1737, 1734, 1731, 1728, 1725, 1722, 1719, 1716, 1713, 1710, 1707, 1704, 1701, 1698, 1695, 1692, 1689, 1686, 1683, 1680, 1677, 1674, 1671, 1668, 1665, 1662, 1659, 1656, 1653, 1650, 1647, 1644, 1641, 1638, 1635, 1632, 1629, 1626, 1623, 1620, 1617, 1614, 1611, 1608, 1605, 1602, 1599, 1596, 1593, 1590, 1587, 1584, 1581, 1578, 1575, 1572, 1569, 1566, 1563, 1560, 1557, 1554, 1551, 1548, 1545, 1542, 1539, 1536, 1533, 1530, 1527, 1524, 1521, 1518, 1515, 1512, 1509, 1506, 1503, 1500, 1497, 1494, 1491, 1488, 1485, 1482, 1479, 1476, 1473, 1470, 1467, 1464, 1461, 1458, 1455, 1452, 1449, 1446, 1443, 1440, 1437, 1434, 1431, 1428, 1425, 1422, 1419, 1416, 1413, 1410, 1407, 1404, 1401, 1398, 1395, 1392, 1389, 1386, 1383, 1380, 1377, 1374, 1371, 1368, 1365, 1362, 1359, 1356, 1353, 1350, 1347, 1344, 1341, 1338, 1335, 1332, 1329, 1326, 1323, 1320, 1317, 1314, 1311, 1308, 1305, 1302, 1299, 1296, 1293, 1290, 1287, 1284, 1281, 1278, 1275, 1272, 1269, 1266, 1263, 1260, 1257, 1254, 1251, 1248, 1245, 1242, 1239, 1236, 1233, 1230, 1227, 1224, 1221, 1218, 1215, 1212, 1209, 1206, 1203, 1200, 1197, 1194, 1191, 1188, 1185, 1182, 1179, 1176, 1173, 1170, 1167, 1164, 1161, 1158, 1155, 1152, 1149, 1146, 1143, 1140, 1137, 1134, 1131, 1128, 1125, 1122, 1119, 1116, 1113, 1110, 1107, 1104, 1101, 1098, 1095, 1092, 1089, 1086, 1083, 1080, 1077, 1074, 1071, 1068, 1065, 1062, 1059, 1056, 1053, 1050, 1047, 1044, 1041, 1038, 1035, 1032, 1029, 1026, 1023, 1020, 1017, 1014, 1011, 1008, 1005, 1002, 999, 996, 993, 990, 987, 984, 981, 978, 975, 972, 969, 966, 963, 960, 957, 954, 951, 948, 945, 942, 939, 936, 933, 930, 927, 924, 921, 918, 915, 912, 909, 906, 903, 900, 897, 894, 891, 888, 885, 882, 879, 876, 873, 870, 867, 864, 861, 858, 855, 852, 849, 846, 843, 840, 837, 834, 831, 828, 825, 822, 819, 816, 813, 810, 807, 804, 801, 798, 795, 792, 789, 786, 783, 780, 777, 774, 771, 768, 765, 762, 759, 756, 753, 750, 747, 744, 741, 738, 735, 732, 729, 726, 723, 720, 717, 714, 711, 708, 705, 702, 699, 696, 693, 690, 687, 684, 681, 678, 675, 672, 669, 666, 663, 660, 657, 654, 651, 648, 645, 642, 639, 636, 633, 630, 627, 624, 621, 618, 615, 612, 609, 606, 603, 600, 597, 594, 591, 588, 585, 582, 579, 576, 573, 570, 567, 564, 561, 558, 555, 552, 549, 546, 543, 540, 537, 534, 531, 528, 525, 522, 519, 516, 513, 510, 507, 504, 501, 498, 495, 492, 489, 486, 483, 480, 477, 474, 471, 468, 465, 462, 459, 456, 453, 450, 447, 444, 441, 438, 435, 432, 429, 426, 423, 420, 417, 414, 411, 408, 405, 402, 399, 396, 393, 390, 387, 384, 381, 378, 375, 372, 369, 366, 363, 360, 357, 354, 351, 348, 345, 342, 339, 336, 333, 330, 327, 324, 321, 318, 315, 312, 309, 306, 303, 300, 297, 294, 291, 288, 285, 282, 279, 276, 273, 270, 267, 264, 261, 258, 255, 252, 249, 246, 243, 240, 237, 234, 231, 228, 225, 222, 219, 216, 213, 210, 207, 204, 201, 198, 195, 192, 189, 186, 183, 180, 177, 174, 171, 168, 165, 162, 159, 156, 153, 150, 147, 144, 141, 138, 135, 132, 129, 126, 123, 120, 117, 114, 111, 108, 105, 102, 99, 96, 93, 90, 87, 84, 81, 78, 75, 72, 69, 66, 63, 60, 57, 54, 51, 48, 45, 42, 39, 36, 33, 30, 27, 24, 21, 18, 15, 12, 9, 6, 3, 0